



INVENTORY OF GREENHOUSE GASES

Local Government Operations for Calendar Year 2007



February 16, 2010

Prepared for the City of Hillsboro



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FEBRUARY 2010

INTRODUCTION AND POLICY CONTEXT

The Intergovernmental Panel on Climate Change (IPCC), the United Nations body that regularly convenes climate scientists, has identified human activity as the primary cause of the climate change that has occurred over the past few decades and quickened in recent years. Consensus statements from the IPCC suggest that human-caused emissions of greenhouse gases (GHGs) must be reduced significantly – perhaps more than 50% globally, and by 80% in wealthier nations that are the largest emitters – by mid-century in order to avoid the worst potential climate impacts on human economies.

Many individual corporations, government agencies, universities, non-profits and even individuals have proactively sought to take on this challenge.

Emissions of GHGs from city government operations are significant, so cities have a direct impact through emissions reductions. Cities also have a role in educating policy makers and citizens. By measuring emissions of GHGs from the City of Hillsboro's operations, this inventory is an important step in taking action, managing risk and leading the way forward.

In May 2007, the City of Hillsboro made a commitment to addressing the problem of climate change by signing the U.S. Conference of Mayors Climate Protection Agreement, which commits signatories, among other things, to establish a baseline of GHG emissions, in order to determine steps to reduce emissions.

Table 1: Overview of Policy Activity Related to Greenhouse Gas Emissions Management

Scale	Recent activity
International	The world's leaders met in Copenhagen in December 2009 to negotiate the next international climate agreement to follow the Kyoto Protocol, which is set to expire in 2012. While the Copenhagen Summit did not result in any legally binding emissions reductions targets, the Copenhagen Accord which was drafted by the United States, China, Brazil, India and South Africa calls for nations to take actions to keep increases in global temperatures below 2 degrees Celsius.
Federal	The US Congress is considering sweeping energy and climate legislation. In parallel, the US EPA has issued mandatory reporting guidelines for large emitters. Other energy and economic stimulus legislation recently passed by the federal government supports renewable energy development and other climate-related initiatives.
Regional	The three regional initiatives – Western Climate Initiative (WCI), Midwest Greenhouse Gas Accord (MGGA), and Regional Greenhouse Gas Initiative (RGGI) – continue to move forward and prepare for implementation (in the event that the federal government does not enact climate legislation) or pre-emption (if federal law takes over). RGGI is already underway as of 2008.
State	In Oregon, recent legislation includes climate and energy bills targeting fuels, solar power opportunities, and GHG emissions from land use and transportation. A number of statewide efforts are facilitating the widespread deployment of electric vehicles. Dozens of states are taking these and similar actions.
Local	At the local level, over 900 cities across the country have signed the US Mayors Climate Protection Agreement, including 13 in Oregon and the City of Hillsboro. A comprehensive GHG inventory is a critical step toward fulfilling a signatory's commitments. Most communities are still at early stages, so we hope Hillsboro's work here will provide encouragement, momentum and a good example to communities elsewhere. Additionally, efforts in the Portland Metro region, including discussions of a Metro GHG inventory and policy options to encourage the reduction of GHG emissions, will further drive efforts to reduce emissions in the Metro area.

CURRENT RELATED REGULATORY REQUIREMENTS OF THE CITY OF HILLSBORO

Mandatory Reporting in Oregon

The Oregon Department of Environmental Quality (DEQ) will require GHG reporting for a wide range of entities, beginning in 2010 for the 2009 calendar year. The threshold for reporting is currently set at 2,500 MT CO₂e (metric tons carbon-dioxide equivalent) annually. In general, the sources and entities required to report are holders of Title V air pollution permits or Air Contaminant Discharge Permits (ACDP), with at least one discrete permitted source emitting above the threshold.

For more information on Oregon's rules, visit DEQ's GHG reporting page:

www.deq.state.or.us/aq/climate/reporting.htm

As currently articulated, rules will not require reporting from many organizations that have aggregate emissions from multiple sources (building energy, fleet fuel, etc.) that together exceed the reporting threshold. Municipal governments and other facilities organizations likely fall into this category of non-reporters. As a result, only a few Oregon municipalities will have regulatory reporting burdens, but many are likely to have total emissions from local government operations that well exceed 2,500 MT CO₂e annually.

While this inventory is for 2007 emissions, if the results follow a similar trend for 2009, this will be the case for the City of Hillsboro. In 2007, Hillsboro's owned, direct emissions (Scope I as defined by the World Resources Institute in The Greenhouse Gas Reporting Protocol) totaled 3,244 MT CO₂e (this includes fleet emissions, natural gas consumption and refrigerant emissions), but no single source of stationary fuels exceeded the 2,500 MT CO₂e threshold. Additionally, the City of Hillsboro does not hold a Title V air pollution permit or an Air Contamination Discharge Permit. Therefore, Hillsboro is unlikely to have state regulated reporting requirements.

Mandatory Reporting at the Federal Level

The U.S. Environmental Protection Agency (EPA) has also issued mandatory reporting guidelines, finalized in September 2009:

www.epa.gov/climatechange/emissions/ghgrulemaking.html

The threshold is 25,000 MT CO₂e per year. Therefore, the City of Hillsboro will not be required to report under the EPA guidelines.

It is possible that federal climate legislation will require participation by some large entities in carbon trading and auctions for emissions allowances. Given the current structure of proposed legislation, very few Oregon entities – and probably no government agencies – will have such responsibilities in the near term.

Mandatory Reporting Resources

Oregon: Oregon's rules are posted at the Department of Environmental Quality at: www.deq.state.or.us/aq/climate/reporting.htm

Federal: EPA mandatory reporting guidelines can be found at: www.epa.gov/climatechange/emissions/ghgrulemaking.html

BOUNDARIES

In many GHG inventory protocols, emissions sources and activities are classified as either producing direct or indirect GHG emissions. Direct emissions are those that stem from sources owned or controlled by a particular organization. Indirect emissions occur because of the organization's actions, but the direct source of emissions is controlled by a separate entity.

To distinguish direct from indirect emissions sources, three "scopes" are defined for traditional GHG

accounting and reporting purposes (WRI, The Greenhouse Gas Protocol, p. 25).

Scope 1 – Direct sources of GHG emissions that originate from equipment and facilities owned or operated by the City of Hillsboro.

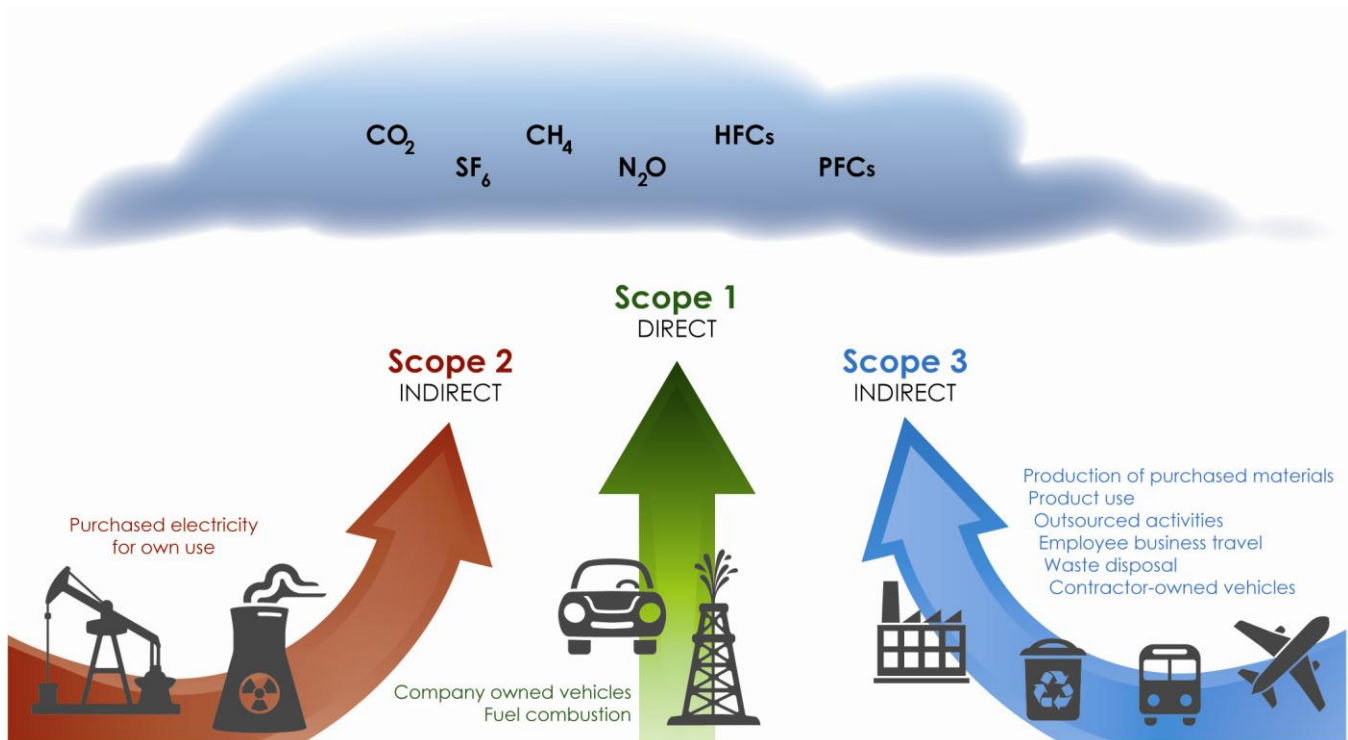
Scope 2 – Indirect GHG emissions from purchased electricity, heat or steam.

Scope 3 – All other indirect sources of GHG emissions that may result from the activities of the institution but occur from sources owned or controlled by another company or entity, such as: business air travel; embodied emissions in material

goods purchased by the institution; emissions from landfilled solid waste; and the commuting habits of institution employees.

Scope 1 (direct) and Scope 2 (indirect) emissions must be reported for most protocols and registries. Scope 3 emissions are indirect and usually considered optional when reporting emissions, but serve to clarify an organization's entire carbon footprint and illuminate the potential regulatory and financial risks an institution may face due to its carbon footprint. Figure 1 illustrates the three scopes of emissions.

Figure 1: Greenhouse Gases and Accounting and Reporting Scopes



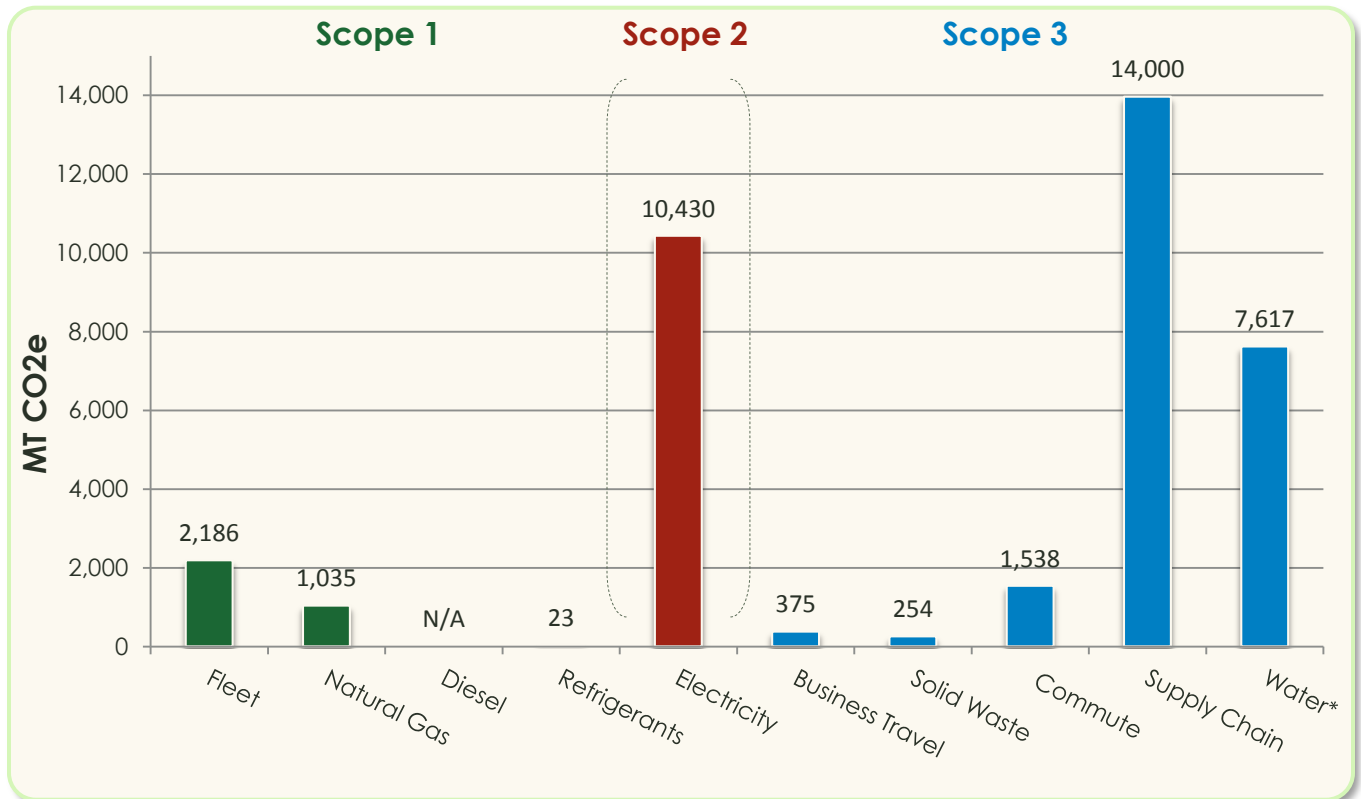
Adapted from WRI/WBCSD Greenhouse Gas Protocol, Corporate Accounting and Reporting Standard (Revised Edition)

OVERVIEW OF RESULTS

The City of Hillsboro's emissions from vehicle fuel and building energy consumption account for 13,674 metric tons carbon dioxide equivalent (MT CO₂e), shown below in Figure 2 and described in Table 2 as Scope 1 and Scope 2 emissions. In addition, this inventory identified 23,746 MT CO₂e of other

emissions from mission-critical activities related to City operations, but outside of its direct control (Scope 3). While the City of Hillsboro may not have direct control over these additional emissions sources, it can influence them. By calculating them here, the City of Hillsboro is able to explore these areas for emissions reduction opportunities.

Figure 2: City of Hillsboro's Greenhouse Gas Emissions from Local Government Operations (2007)



(The inventory was carried out according to high-consensus protocols and tools, and in accordance with the guidelines of the Oregon Department of Environmental Quality. See Methods below for more detail.)

* Water represents the City of Hillsboro portion of Joint Water Commissions (JWC) emission for water treatment and distribution.

Scopes I and II yield 13,674.1 MT CO₂e. For sense of scale, this is *equivalent*¹ to:

- Annual emissions from 2,372 passenger vehicles
- Annual emissions from the energy consumed by 1,107 homes (US average)

Scope III emissions yield 23,745.8 MT CO₂e. For sense of scale, this is *equivalent* to:

- Annual emissions from 4,119 passenger vehicles
- Annual emissions from the energy consumed by 1,922 homes (US average)

¹ Source: <http://www.epa.gov/RDEE/energy-resources/calculator.html>

Table 2: Description of the City of Hillsboro's Operational Greenhouse Gas Emissions Categories

WRI Scope	Emissions Category	MT CO ₂ e	Description
Scope 1 (Direct Emissions)	Fleet	2,186	<p>This emissions category includes emissions from the following three sources:</p> <ul style="list-style-type: none"> 401 owned fleet vehicles <ul style="list-style-type: none"> 335 are powered by a blend of 90% unleaded gasoline mixed with 10% ethanol 49 are powered by ultra-low sulfur diesel 17 are powered by compressed natural gas (CNG) 40 owned other gasoline, diesel and propane equipment <ul style="list-style-type: none"> 4 are powered by gasoline 35 are powered by diesel
	Natural gas	1,035	The City of Hillsboro uses natural gas for space heating at 25 facilities.
	Other fuels	N/A	The City of Hillsboro has nine diesel generators located at various buildings; however, a minimal amount of fuel is consumed by these generators. Data for this emissions source was not separated from diesel used in mobile vehicles; therefore, emissions from generators are accounted for in the fleet emissions.
	Refrigerants	23	The HVAC systems at the City of Hillsboro's facilities use HCFC-22 (commonly known as R-22) refrigerant. Though preferable to prior refrigerants including CFCs, the manufacture of R-22 contributes significant greenhouse gases to the atmosphere, and it still contains chlorine, which contributes to atmospheric ozone depletion. ²
Scope 2 (Indirect Emissions)	Electricity	10,430	<p>The City of Hillsboro calculated the electricity consumption from 30 buildings. Additionally, the city uses electricity for a range of other activities such as street lighting, traffic signals, and lighting at city parks. This electricity consumption totaled 13,731,652 kWh for 2007.</p> <p>The GHG emissions shown here were calculated using the emissions factor for Portland General Electric, as reported to the EPA's Emissions & Generation Resource Integrated Database (eGRID). For a complete discussion of how this emissions factor compares to the regional mix, see the sensitivity analysis section below.</p>
Scope 3 (Indirect Emissions)	Business travel	375	Business travel encompasses employees' use of airlines, rental cars, and personal vehicles for travel associated with training, conferences, and meetings.
	Solid waste	254	<p>Six franchised waste haulers collect residential and commercial waste within City limits. Emissions for this section consist only of waste from City facilities. Waste includes dry (e.g., construction debris), wet (e.g., municipal solid waste), yard debris and recyclable materials including paper, plastic, metal and glass. Each of the two regional landfills (Columbia Ridge and Riverbend) where City waste is disposed currently capture and flare the methane GHG produced by the waste.</p> <p>According to the Metro government, Columbia Ridge has begun generating electricity from the methane, and Riverbend has plans to do so in the near term.</p>
	Water Distribution	7,600	The City of Hillsboro purchases drinking water from the Joint Water Commission, the organization that treats water from the Tualatin River and the Barney Reservoir. The emissions reported here are based on a preliminary GHG inventory of the JWC and are prorated for Hillsboro based on the amount of water consumed by Hillsboro citizens (Hillsboro consumes roughly 40% of JWC water).

² Source: <http://www.epa.gov/Ozone/title6/phaseout/22phaseout.html>

	Commute	1,540	The City of Hillsboro employs 646 people. The majority of employees (83.5%) drive alone as the method of commuting. The average distance of travel was 15.2 miles one way. Of the 16.5% of employees who use alternative modes to commute to work, approximately 7% use light rail, 5% carpool, 2% ride the bus, 1.5% ride a bike, and 1% walk.
	Embodied emissions in purchased goods and services	14,000	Embodied emissions in purchased goods and services accounts for emissions that result from all of the products and services the City of Hillsboro purchases. In 2007 there were over \$35.6 million worth of goods and services purchased by the City. These purchases were broken into four broad-based categories: Facilities and Construction (64%); Equipment (15%); Materials and Services (13%); and Professional Services (8%).

The results shown above indicate a substantial opportunity to reduce the emissions of GHGs from City operations. Scope 1, direct emissions, arise from sources over which the City has direct control and which reflect the greatest opportunity for reductions. Scope 2, indirect emissions, from electricity are substantial and also provide a significant opportunity for reductions. They are indirect because while Hillsboro demands and ultimately consumes the electricity, the City has no control over the types of fuels (coal, gas, etc.) that are used to generate the electricity at the utility level. Scope 3, indirect emissions, are those which are shared with entities providing the product or service (e.g., airplane for travel or from the production of purchased goods).

Given the anticipated growth of population in Hillsboro over the next several decades, this challenge will likely grow due to an increase in needed services by the growing population. However, improved efficiencies that reduce emissions are crucial to ensure that per-employee or per-capita emissions are reduced. This inventory allows City management and staff to understand in quantified terms which activities produce GHG emissions. With this information climate action teams will be better able to set reduction targets and to identify and implement projects to reduce emissions.

This inventory also provides an important stepping stone toward the development of a community-wide GHG inventory, which will be needed to engage the broader community in actions to reduce GHG emissions.

METHODS: DATA, PROTOCOLS, AND SENSITIVITY ANALYSIS

This inventory follows the Local Government Operations Protocol, which provides the highest-consensus guidelines for minimum reporting scope and was developed jointly by The Climate Registry and other organizations³. However, the protocol only requires the reporting of emissions in Scopes 1 and 2. This inventory has gone further to include several shared emissions categories from Scope 3. This use of additional high-quality public-domain tools to estimate Scope 3 emissions makes this inventory more state-of-the-art than inventories focused only on mandatory or bare-minimum boundaries. This more integrated and holistic approach paints a more accurate portrait of total emissions associated with the City of Hillsboro's mission-critical business activities.

All emissions are reported in metric tons of carbon-dioxide equivalent (MT CO₂e). The analysis attempts to cover all six "Kyoto gases" including: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), sulfur hexafluoride (SF₆) and the groups of high-GWP (global warming potential) gases, perfluorocarbons (PFCs) and hydrofluorocarbons (HFCs). Overwhelmingly, the direct and indirect CO₂-

³ The Local Government Operations (LGO) Protocol was developed as a collaboration of The Climate Registry (TCR), the California Air Resources Board (CARB), the California Climate Action Registry (CCAR, now the Climate Action Reserve), and ICLEI Local Governments for Sustainability. The LGO Protocol follows the same format as The Climate Registry's General Reporting Protocol (GRP).

equivalent emissions are CO₂ from combustion of fossil fuels.

The analysis drew on high-consensus public-domain tools for emissions factors and methods. Some sources (such as natural gas consumption) are based on highly accurate data and accepted emissions factors. Other sources (such as employee commute) are estimated by combining available data with careful assumptions and sensitivity analyses. Still other sources (such as embodied emissions in purchased goods and services) were calculated using estimated data and emissions factors based on averages for the U.S. economy as a whole.

This section is designed to describe where the data was collected and the basic methodology, assumptions and level of estimation / accuracy for each emissions source.

Fleet

The City of Hillsboro works with Bretthauer Oil as a primary fuel vendor (including compressed natural gas, CNG). Upon request, Bretthauer Oil provided City staff with reports outlining the amount of fuel purchased in 2007. The City of Hillsboro's Facilities and Fleet Department provided a vehicle list and information about overall fleet fuel efficiency. The Local Government Operations Protocol provided emissions factors for gasoline, diesel and CNG.

With two minor exceptions noted below, data related to vehicle fuel consumption is complete and results for this category of emissions should be considered highly accurate. A small amount of fuel may be unaccounted for due to employee use of personal vehicles for City business which wasn't expensed or if an employee purchased fuel for a City vehicle from a vendor other than Bretthauer. This would be a rare occurrence and is unlikely to change the stated emissions significantly. Additionally, the City owns one propane-powered stadium turf sweeper for which fuel is not accounted in the inventory. The equipment consumes a relatively small amount of propane which is purchased directly from a local vendor. Therefore, data for this fuel was not available for the inventory. However, staff verified

that the vehicle is not frequently used and emissions are relatively insignificant and will not impact the overall emissions for the City fleet.

Natural Gas

Northwest Natural, the City of Hillsboro's natural gas utility, provided consumption records for all City owned and leased facilities for 2007. Data related to natural gas consumption is complete and results for this category should be considered highly accurate. The Local Government Operations Protocol provided the emissions factor for natural gas based on an unspecified average heat content for the U.S.

Other Stationary Fuels

The City of Hillsboro has nine generators located at various facilities. A relatively minimal amount of fuel is consumed by the generators. Data on fuel consumed by the generators was not differentiated from other fuel sources; therefore, the emissions from the fuel consumed by the generators were captured in the fleet emissions.

Refrigerants

The City of Hillsboro uses refrigerants in facility HVAC systems and in several data storage rooms. Refrigerant is supplied by Johnstone Supply. The type of refrigerants used are R-22 and R-410A. Although the City has facilities that use both R-22 and R-410A refrigerants, for 2007 only R-22 was purchased. Purchasing reports indicate the City purchased 30 pounds of R-22 refrigerant in 2007.

Electricity

Portland General Electric (PGE) is the utility that serves City of Hillsboro facilities with electricity. PGE provided the City of Hillsboro with an Annual Service Report showing total kWh annual consumption for 2007. This information was cross-referenced to the inventory of City facilities that was provided by Facilities and Fleet department.

The calculations reported in Figures 2 and 3 of this report are calculated using the emissions factor for PGE, as reported by PGE to the EPA's Emissions &

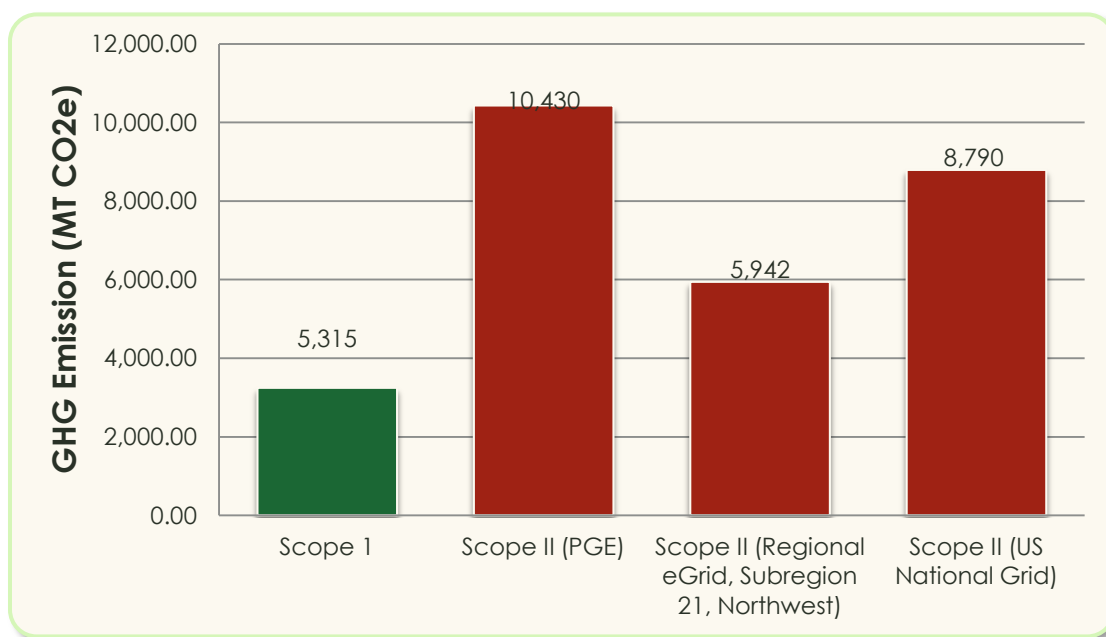
Generation Resource Integrated Database (source: <http://cfpub.epa.gov/egridweb/>) for the most recent reporting period. The available data is from 2005; subsequent inventories will utilize the most current available data on the utility grid mix in order to ensure the most accurate emissions factor from electricity. The carbon intensity of PGE's generation is distinctly different from (i.e., higher than) the emissions of the regional and national grids. Since PGE is the utility directly serving the City of Hillsboro, it is considered to be the most accurate emissions factor to use in these calculations.

Virtually no utility is an island unto itself, and utilities are connected (often at peaks and troughs) to many outside power sources. Therefore, it is possible to

argue that, because of this connectedness, the regional grid is the more meaningful number. Indeed, in many cases, electricity is traded over long distances, so the national grid also has some meaning. When these differences exist, it is important to acknowledge the differences in order to be able to compare emissions to other organizations more accurately that may use one or more emissions factors in their calculations.

Figure 3 below shows how the emissions totals would differ for City of Hillsboro's Scope 2 emissions when using the local utility emissions factor for PGE, the regional mix for the Northwest Power Pool or the national mix for the United States.

Figure 3: Electricity Emissions Scenarios for the City of Hillsboro using Local, Regional, and National Emissions Factors (2007)



Business Travel

Data for business travel was gained by collecting travel reimbursement forms submitted to the Finance Department. The travel reimbursement forms require employees to attach copies of airline tickets or mileage traveled by vehicle. Total airline miles for all trips were calculated using webflyer.com, which provided the mileage for given itineraries.

Emissions from rental vehicles was estimated based on the number of days vehicles were rented by employees; specific data on mileage was unavailable. A range of mileage was averaged and applied to the total number of days that vehicles were rented. The range used was 10 to 75 miles; the average range was 43 miles resulting in 0.4 MT CO₂e. If emission were based on the low end estimate of 10 miles, emissions for rental vehicles would be 0.1 MT CO₂e; similarly, if

the high range of 75 miles were used the emissions would be 0.7 MT CO₂e.

The data for business travel does not include business travel by light rail or bus. At the time the GHG inventory was being conducted there was not an accurate source of data to indicate usage of public transportation for business travel, and therefore these emissions are not captured in this inventory. Additionally, there is inherent scientific uncertainty related to the impact of fuel combustion emissions on the upper atmosphere. Based on the best scientific data currently available, the air travel emissions reported here were calculated using a Radiative Forcing Index of 2.0.

Solid Waste

Data on solid waste collection and disposal was provided by the City's departments, to ensure that all City-generated solid waste was accounted for, and from the City's 6 franchised waste haulers (Aloha Garbage, Cornelius Disposal, Garbarino Disposal, Hillsboro Garbage Disposal, Valley West Refuse Disposal, and Washington County Drop Box Service). Due to the limitations of the solid waste data, the numbers in this report are calculated based on the number of containers and frequency of collection from City facilities. In this methodology all containers are assumed to be full. Therefore, the total does not account for partially-full containers and is not 100% accurate. City staff continue to work with the waste haulers to devise methods to more accurately capture volume and/or weight of solid waste generated by City facilities.

Water

Drinking water treatment and distribution to City facilities, residents and businesses is a major source of GHG emissions, since it takes a substantial amount of electricity to treat water and pump it throughout the community, and are therefore an important component of the City's GHG inventory. The City of Hillsboro shares water treatment and distribution infrastructure with and is the managing partner of the Joint Water Commission (JWC), a consortium of local government entities including Hillsboro, Forest

Grove, Beaverton, Tigard and Tualatin Valley Water District (TVWD). As the JWC managing agency, the City of Hillsboro Water Department maintains data for the JWC and provided data for this inventory.

At this time, the analysis includes only emissions from the City of Hillsboro's portion of JWC's electricity consumption and supply chain (embodied emissions from purchased goods and services). The City's portion was calculated by applying the City's percentage (39.3%) of water use from the overall JWC electricity and supply chain. As the JWC completes its own inventory during 2010, other emissions sources will be added to the City inventory, as appropriate. However, electricity and supply chain are expected to be by far the largest emissions sources related to drinking water. The results for drinking water-related emissions are presented in this report for a sense of scale. In order to fully contextualize emissions related to drinking water treatment and distribution, a community-wide inventory will be needed. An approach for a community-wide inventory is under consideration by City staff and relevant neighboring jurisdictions.

For both the City and JWC inventories, the PGE grid mix has been utilized in order to provide consistency in methodology.

Commute

To calculate the emissions from employees commuting to and from work, a survey was sent to all employees asking the distance they commute, what methods they use to get to work (i.e., drive alone, carpool, ride the bus, bike or walk), and their vehicle fuel efficiency. Approximately 220 responses (34% of all employees) were received; the responses were averaged and applied to all employees.

This data assumes that employees estimate their commute distance and fuel efficiency for their vehicles. A survey response rate of 34% is more than sufficient to apply this information for a reasonable estimate of commute emissions for the organization as a whole. While this methodology is reasonable and provides a useful sense of scale in understanding the impacts from this mission-critical activity, the

amount of estimation inherent in the calculations means that it is less precise than other Scope 1 and 2 emissions sources. This is indicated in our results by our use of fewer significant figures.

Embodied Emissions in Purchased Goods and Services

For estimating the emissions associated with producing the goods and services purchased by the City of Hillsboro, this analysis relied on Economic Input-Output Life-Cycle Analysis (EIO-LCA), a public-domain tool developed by Carnegie Mellon University.⁴

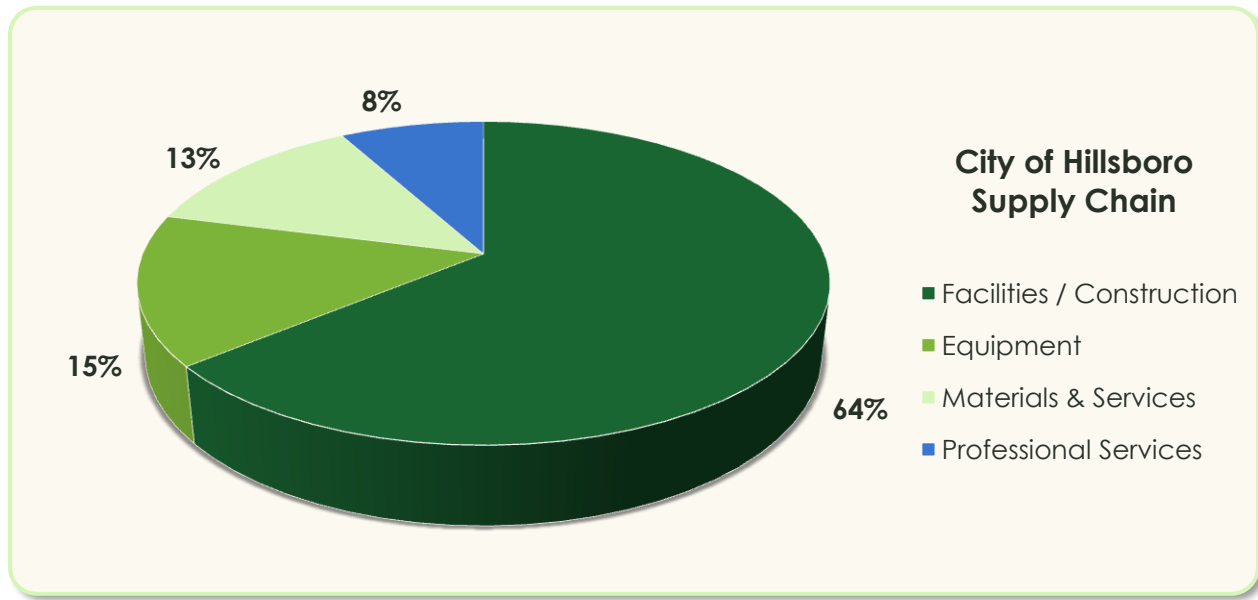
The EIO-LCA tool provides GHG emissions data per dollar of product purchased for 491 sectors of the U.S. economy. City of Hillsboro staff collected information about categories and dollar value of purchases made in 2007. The data was then sorted into categories matching those in the EIO-LCA model and the emissions factors from the model were applied to each. The model provides emissions data per 1997 dollar, so a correction factor was applied to account for inflation based on the change in the Consumer Price Index for all goods and services minus food and energy between 1997 and 2007.

While City staff worked hard to collect information for purchases made by all City departments, it was impossible to know the specifics of each purchase, so categories were assigned based on the best information available and reasonable assumptions. Additionally, the model is based on averages of the U.S. economy as a whole and does not differentiate between types of purchases such as virgin paper vs. 100% post consumer recycled content paper. Approximately 2.5% of the aggregate purchases were excluded from the inventory because the purchased item(s) were unknown (specifically, credit card transactions with unlisted vendors).

The emissions reported within this category are an estimation used for sense of scale purposes. They

are different from all other Scope 1, 2, and 3 emissions sources in the degree of data estimation and methodological uncertainty. However, given the magnitude of the results it is important to understand that this area of emissions should not be ignored. In fact, supply chain management (purchasing) is arguably one of the most critical areas where the City may identify and implement efficiencies, including a reduction in overall purchases, which could have a significant impact on GHG emissions. Further, the City has an opportunity to influence emissions by reviewing its purchasing policies in consideration of the full supply chain, including manufacturing processes, resources required, and shipping locations of the materials and services the City utilizes. In this way the City can lead vendors and suppliers to improve product life cycle efficiencies and delivery of services. The City might also influence change in cooperation with neighboring jurisdictions by identifying opportunities to reduce volume, redundancies and life cycle impacts of purchases.

⁴ Carnegie Mellon University Green Design Institute. (2008) Economic Input-Output Life Cycle Assessment (EIO-LCA), US 1997 Industry Benchmark model [Internet], Available from: <http://www.eiolca.net> Accessed 1 January, 2008.

Figure 4: Embodied Emissions in Purchased Goods and Services for the City of Hillsboro (2007)

COST OF CARBON: QUANTIFICATION AND RISK

Assembling a GHG inventory is an opportunity to analyze a particular kind of financial risk, i.e., the implications of a “cost of carbon” – a direct or indirect cost associated with GHG emissions, as a result of policy. Many analyses of proposed legislation have indicated a likely range of this cost, and we can see examples in countries that have already capped CO₂ emissions.

A recent EPA analysis⁵ of proposed climate policy suggests that, within a few years of implementing a cap-and-trade system, the cost of carbon could be around \$15 per MT CO₂e. One proposed “reserve price” (or price floor) is \$10, while short-term “escape hatch” prices (or price ceilings) have been around \$30. This range provides a sense of the City of Hillsboro’s total direct and indirect financial exposure related to a cost of carbon.

This total financial risk is unlikely to be borne entirely by the City. Indeed, just as part of the carbon footprint is shared with others – from employees

who commute to vendors that supply the organization with goods and services – the cost-of-carbon risk will likely be shared. The prices quoted above are an approximation of the financial risk that could emerge under likely climate policy scenarios.

SUSTAINABILITY EFFORTS AND CLIMATE ACTION AT THE CITY OF HILLSBORO

The City of Hillsboro has demonstrated a commitment to increasing efficiencies within its operations in order to reduce costs, improve the quality of life for City residents, and to make a significant contribution to the reduction of environmental impacts, including emissions of GHGs. In 2007, the City signed the U.S. Conference of Mayors Climate Protection Agreement to regularly measure GHG emissions, continue to implement emissions-reducing projects, and to reduce emissions to 7% below 1990 levels.

Specific actions that the City has taken include conversion of all City red, green and stop-hand traffic signals to high efficiency light emitting diode (LED) bulbs, rebates to citizens to purchase high efficiency clothes washers to reduce water use and associated energy, building permit fee waivers for renewable energy systems, procurement of alternative fuel fleet vehicles and electric vehicle charging stations,

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http://www.epa.gov/climatechange/economics/pdfs/HR2454_Analysis.pdf

purchase of renewable energy, flex work schedules to reduce commuting, photovoltaic solar energy systems, and construction of the nation's second Leadership in Energy and Environmental Design (LEED) Gold certified municipal building in 2005.

To further its commitment to sustainability and GHG reduction, the City has hired a full-time sustainability project manager to develop a comprehensive program including a baseline of internal operations and corresponding data, formation of a City-wide sustainability steering committee, and coordination of sustainability projects across all City departments.

The City is also a recipient of U.S. Department of Energy (DOE) Energy Efficiency and Conservation Block Grant (EECBG) funding that will allow the City to develop a comprehensive Energy Efficiency and Conservation Strategy (EECS) and Climate Action Plan that will contain goals strategies and projects to reduce City energy use and GHG emissions. This report is a key tool that will allow City staff to measure the impact of projects going forward and to report on progress.

Table 3: Potential Climate Action Opportunities and Existing Efforts by the City of Hillsboro

Category	Climate Action Opportunities	Current Level of Action at the City of Hillsboro
Policy	-Signatory to the U.S. Conference of Mayors Climate Protection Agreement	-Building permit fee waiver for renewable energy systems -Completed initial internal GHG inventory
Planning	-Targeted sustainability and energy planning efforts -Leveraged federal funding for energy use reduction and greenhouse gas reduction efforts	-Established goals/targets for energy use and GHG reduction -Established working groups to identify energy and GHG reducing projects -Developed Energy Efficiency and Conservation Strategy -Creating Climate Action Plan
Transportation	-Alternative and fuel efficient vehicles -Electric vehicle charging infrastructure -Low-carbon fuels for fleets -Bicycle and pedestrian facilities and incentives -Flex work schedules -Employee mass transit benefit program -Street signal timing projects	-Substantial fleet of alternative fuel and hybrid vehicles -TriMet pass -Flex work schedules -Streetlight signal timing optimization -Installation of electric vehicle charging stations -Retrofit school and pedestrian crossing "beacons" to solar
Buildings and Energy	-Building systems efficiency -On-site renewable power generation -Renewable power purchasing -Other green building strategies -Refrigerant management / phase-out	-LEED Gold City Hall -City Hall 100% Clean Wind renewable energy program through electric utility -Conducted energy efficiency assessments and retrofits -Installed two solar energy systems; plans for three more
Solid Waste and Recycling	-Recycling -Source reduction / use less -Ensure landfill management (vendor specifications)	-City facilities provide recycling for employees

Category	Climate Action Opportunities	Current Level of Action at the City of Hillsboro
Purchasing / Procurement	<ul style="list-style-type: none"> -Green / sustainable purchasing guidelines/policies -Specifications for vendors -Building standards 	<ul style="list-style-type: none"> -City guidelines that encourage selection of more sustainable products (e.g., recycled content paper) -City contracts encourage vendors to recycle and use sustainable materials -Contractors for design/build of City facilities scored in part on sustainability aspects
Water	<ul style="list-style-type: none"> -Energy generation through renewable energy systems, including solar, hydro -Water conservation -Water re-use 	<ul style="list-style-type: none"> -Solar system incorporated into City reservoir (also noted above) -Comprehensive water conservation program, including education and outreach and incentives for efficient appliances -Parks maintenance facility utilizes water reuse system for equipment washing -Installed variable flow pumps (VFD)
Infrastructure construction / development Maintenance	<ul style="list-style-type: none"> -Alternative paving options -Materials reuse and recycling -High efficiency traffic and street lighting -Mechanical aspects, such as variable flow/speed devices, upgraded controls, boilers, etc 	<ul style="list-style-type: none"> -Implementing porous concrete ally -Operational reuse of aggregate, other materials -Replaced all red and green traffic signals with high efficiency LEDs -Deployed HVAC control systems to maximize efficiency of heating/cooling systems -Installed high efficiency boilers -Variable speed water pumps in fountains
Business travel	<ul style="list-style-type: none"> -Other fuels/vehicles strategies Videoconferencing 	<ul style="list-style-type: none"> -Efforts to teleconference are made -Considering videoconferencing

CONTACT INFORMATION AND ADDITIONAL RESOURCES

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